NASA Chat: Why Meteorites Matter
Experts Dr. Bill Cooke and Dr. Marc Fries
November 8, 2012

Moderator Brooke: Hello everyone, and thank you for being here. Our experts have had an unexpected delay -- very sorry about this. We're anticipating that the chat will start between 2:30-3 EST.

Moderator Brooke: Hi neal. Thanks for being here. ☺

Moderator Brooke: Hi sandy and nasalove -- sorry for the delay. Our experts are en route.

Moderator Brooke: Welcome, JThwaits...

JThwaits Hi there, thanks

Moderator Brooke: We're awaiting our experts. These things happen sometimes. ☺

Moderator Brooke: Hello Judy, and welcome.

Nasalove Ok!

Moderator Brooke: Thanks for your patience.

Moderator Brooke: While we wait, here's some good info about Meteorites and Craters. http://planetary.msfc.nasa.gov/Meteorites_and_Craters.html Astronomer Barbara Cohen here at Marshall prepped this for us.

Moderator Brooke: If you're just joining us...our experts have had an unexpected delay. Sorry about that -- thanks for being here.

Yagami: Hello there!

Moderator Brooke: Welcome, Yagami!

Yagami: Thank you so much. I just have to say that you guys are a great inspiration to kids like me. I sincerely hope that Obama give you more money to do more missions in space. Sorry for not knowing that I had to ask a question.

Moderator Brooke: What kind words, Yagami -- thank you. We really hope these chats will help people learn about our universe.

AAHaulward: Hello, NASA

Moderator Brooke: Greetings --thanks for being here.

Sunniejo: hello

Moderator Brooke: Hello, sunniejo.

Moderator Brooke: So while we wait -- have any of you ever found a meteorite?

NASA Chat: Why Meteorites Matter
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JThwaits: Absolutely, the knowledge shared by NASA benefits not only Americans but worldwide as well. Greetings from South Africa!

Moderator Brooke: Greetings from across the world! So what time is it there in South Africa?

Yagam: I wish... >.<

Moderator Brooke: Me, too. ☺

Moderator Brooke: For those of us who haven't hunted these...what is the nickel test, sunny?

Nasalove: Yes, I found one last year! :)

Moderator Brooke: Wow, lucky you! How large was it?

JThwaits: Would you believe it's 9:19PM over here, Thursday evening

Moderator Brooke: We appreciate you spending your evening with us. It's just after lunchtime here in Huntsville.

geth1766: hello

Moderator Brooke: Hi geth1766 -- thanks for being here!

Nasalove: I was 0.54cm long :)

Moderator Brooke: ☺ Nice.

Sunniejo: Well i purchased a test kit. It is said all meteorites contain nickel

Moderator Brooke: You're educating all of us. I'm not a meteor expert, just a lowly moderator I didn't know such kits existed...

Yagami: Oh, oh! I have a question! What is the biggest meteorite size NASA knows of?

Moderator Brooke: Yagami, our experts are en route. May I hold your question for them?

geth1766: so the meteoriet was it just found after entering the eather atmosphere ?

Moderator Brooke: I'm pulling from some other materials here, but meteorites are pieces of asteroids and other bodies like the moon and Mars that travel through space and fall to the earth. They are rocks that are similar in many ways to Earth rocks, but it is exciting to find a piece of another planet here on Earth. Meteorites fall to Earth all the time and are distributed over the entire planet.

Sunniejo: it is a liquid. Two drops on a swab will turn pink if nickel is present.

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November 8, 2012

Moderator Brooke: Wow...interesting. But nothing turned pink on your finds?

Yagami: Yes, please! ^-^ ~Craves for knowledge.~

Moderator Brooke: We like that you crave knowledge! Hopefully our experts will be able to help satisfy that.

geth1766: ouh well that cool i not a little bite about space my self

Moderator Brooke: That's great -- our experts will be happy to meet you when they arrive!

geth1766: ouh ok cool so yo can see what they are made up of groooove

Moderator Brooke: Hello everyone, and thank you for being here. Our experts have had an unexpected delay. We're anticipating that the chat will start between 2:30-3 EST.

geth1766: been studing space for 30 years

Moderator Brooke: That's great, geth. Any particular specialty?

geth1766: have the found any microbs on the meteorite ?

Moderator Brooke: I'll have to defer that one to Bill and Marc when they arrive. I'd like to know myself!

Sunniejo: no pink for my metal rock unfortunately. it resembled a sikhote-alin so much too

Moderator Brooke: But still, I admire that you're out looking for meteorites. Aren't they very valuable, if they're verified as authentic?

geth1766: sorry my spelling way off today guys and gals

Moderator Brooke: You're doing great. ☺

Moderator Brooke: Hello everyone, and thank you for being here. Our experts are en route. We're anticipating that the chat will start between 2:40-3 EST. Sorry about the delay, but we're glad you're here.

geth1766: or u can go to where they my be one that toched down that be a lucky find fun for sure

Moderator Brooke: Our experts will be talking a bit today about some of the recent meteors that have made the news. They might have some advice on where to look for meteorites.

geth1766: there a few in canada

Moderator Brooke: We're hoping to partner more with observatories around the world for live views of meteor showers and other events.

NASA Chat: Why Meteorites Matter
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November 8, 2012

NarfArf : re there any interesting websites to go to for the tracking of meteors/discovery of new objects in our solar system?

Moderator Brooke: Welcome, Narf -- I've got your question loaded up for our experts when they get here. I think they can help you out on that.

Sunniejo: oh^^ that would be awesome brooke

Moderator Brooke: On the live views? Yes, we've had huge interest in these events. It's nice to be able to watch online when the local weather clouds out the sky events.

AAHaulward: Brooke do you have any information about the existence of a museum in the USA about the meteorites that were found -i don't know maybe a piece of it- or do they prefer just to store them in appropriate environments to study latern on?

Moderator Brooke: Hi AA -- I'm pretty sure Bill and Marc will know that. The picture above on this page shows a nice meteorite that I believe is displayed at the Smithsonian.

NarfArf: Many thanks! I plan to be tweeting whatever interesting answers I get on the sideline, sharing the knowledge and all. :)

Moderator Brooke: Narf, we'd appreciate that very much. Thank you for getting us into the Twitterverse. ☺

Sunniejo: Yes that would help see past the clouds!

Moderator Brooke: Agreed -- especially in the winter months, when it seems like we're always cloudy here.

geth1766: ok is out in the country for best view if you have a portable telescope i did i droped it and it broke :(can affard a new one

Moderator Brooke: Oh, that's too bad, geth. ☹

A.bombard: This is very cool and really exciting! Theres nothing i love more to learn about than our universe. I recently signed up for an online Astronomy Course. I personally use an old Celestron Nexstar 107 (i believe that is the number) Reflector Telescope

Moderator Brooke: That's terrific -- we love people who love space. ☺ Is the course for a formal degree, or to expand your knowledge?

Yagami: What is a good telescope for a newcomer to space exploration? I can't afford so much cause i'm only a kid but I can ask my dad and mom to maybe help a bit. ^-^ I've only been to an observatory

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once, and I loved it!!! Oh and Neil deGrasse Tyson is one of my idols! He spellbinds me with his thoughts. ^-^

Moderator Brooke: Yagami, your enthusiasm is wonderful. We'll ask Bill about the telescope. I'll see if he can provide us with a good link.

geth1766: NASA would also have spicemnes as well

Moderator Brooke: Hello everyone, and thank you for being here. We're anticipating that the chat will start between any moment. Thanks for your patience!

geth1766: so the test they do on the meteoriet can it tell the age of it ?!

Moderator Brooke: They can, geth -- it's one of the ways they can glean information about our solar system.

Sunniejo: Where i live in northern utah we see hundreds of meteros each year. just last night three huge fireballs streaked our sky

Moderator Brooke: That's amazing -- you have perfect skies for viewing. You must get an incredible show for the larger shows, like the Perseids?

A.bombard: Its a Certificate online prgram through Duke University, im personally located in New York. Its to expand my knowledge

Moderator Brooke: Fantastic -- I didn't know they had a program like that. You're helping all the space buffs here in the chat with this info. ☺

8brat8: Is there any indication that large local mineral deposits such as silver in Peru could be linked to meteor impacts during the last phases of our planetary formation?

Moderator Brooke: Hi 8brat8 -- I'm going to hold that one for our experts, who are just about here. That's a great question.

Annamari: Hello. I'm live in Hungary and I be interested.

Moderator Brooke: Greetings to Hungary -- glad you're here, Annamari!

A.bombard: One day i hope to take a Formal Degree course! :)

Moderator Brooke: Of course. ☺ But this is a great start that sounds flexible, too, for a busy person.

Sunniejo: Dr. Randy Korotev has a wonderful website for all meterite info. He started in NASA in 1969

Moderator Brooke: Thanks, sunny! Do you have that link, and I'll share it?

NASA Chat: Why Meteorites Matter
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November 8, 2012

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geth1766: light crive densatiy for the telescope like to find out about setting for better viewing if i get a new one

Moderator Brooke: See, even though it's sad your old one is no more...this was just a sign that it's time for an upgrade. ☺

Moderator Brooke: Hey everyone -- Marc and Bill are here! I'm going to turn the chat over to them, but I'll still be here in the background if you need me. Without further ado...here are Marc and Bill!

Marc Fries: Narf, you asked about interesting websites to track meteors. Go to fireballs.ndc.nasa.gov to see information on meteors tracked by the NASA network and AMSMeteors.org to see eye-witness reports.

Yagami Hahah! All I want is to KNOW. I want to KNOW so much that I think I will pass out. I love knowledge, and exploration.. I love to KNOW why and HOW things happen. It makes me happy. I'm not happy with just "believing".. Know know know. ^-^ Oh, what is your favorite thing about cosmos Brooke?

Moderator Brooke: Yagami -- I love the whole cosmos, but I'm a simple person. I love Lady Luna, our Moon, most of all. ☺ Thank you for asking.

Moderator Brooke: Yagami, you asked earlier about the largest meteorites that have been found. Per Bill Cooke, there are meteorites as large as Volkswagens in museums.

Neal: I am a geologist/teacher at the Coca-Cola Space Science Center in Georgia. As you can imagine we get people in all the time that believe they have a meteorite. Recently we have had one brought in that is intriquing. I have heard from various sources that meteorites can't have holes similar to vesicular basalt, there exceptions to this right?

Marc Fries: Yes there are exceptions but they are extraordinarily rare. My suggestion is to contact the Smithsonian Mineral Sciences Department. Take very good, clear photographs and they will examine them and give an informed opinion on what you have.

Moderator Brooke: geth, you asked earlier about microbes on meteorites. Per Bill Cooke, no extraterrestrial microbes have been confirmed on meteorites.

Moderator Brooke: Yagami, you asked earlier about a good telescope recommendation. Per astronomer Bill Cooke, "If you can't afford to spend at least $200, then a good pair of binoculars would probably be better for stargazing than a cheap telescope." Hope this helps you.

geth1766: may i ask what are the most important finds when you study fallin meteorites like this

Marc Fries: The most important meteorites are any fresh finds that have not seen alot of terrestrial alterations. The longer a meteorite sits on Earth, the more it rusts and changes. Among the freshly fallen

ones, the most scientifically useful ones are the rare types -- martian, lunar or carbonaceous meteorites.

Neal: Marc, what are the most common non-metal minerals associated with meteorites?

Marc Fries: Olivine and pyroxene are the most common.

Moderator Brooke: 8brat8, you asked earlier about the local mineral desposits in Peru, and if they had any relationship to meteors. Per astronomer Bill Cooke, no relationship between those two...

Sunniejo: are there rare meteorites that contain iron without the presence of nickel?

Marc Fries: There is a range of compositions with respect to the amount of nickel found in metal in meteorites. To my knowledge, there are no meteorites that commonly contain pure iron with no nickel however.

Tori: Just curious what would one do if they were to come across what they thought was a meteorite? Would they bring it to a university in the area, a science center, or contact another organization?

Marc Fries: Yes, universities or science centers are good choices. The Smithsonian's Mineral Sciences Department is another excellent option.

Annamari: How old the oldest meteorit what the Nasa find?

Marc Fries: It depends on what you mean by 'old.' If you mean how old since the rock formed, then the oldest meteorites are about 4.5 billion years old. If you mean meteorites that have been on Earth the longest, the oldest would be one found in Antarctica that has been on Earth for about 1 million years. There are a few 'fossil' meteorites even older that have completely turned to Earth rock.

Moderator Brooke: Thanks for all of these great questions...Marc and Bill are working on answers. And THANK YOU so much for your patience earlier as we got the chat rolling. Great group we have here!

Siddhesh: Hey I am a science fiction author and wanted to confirm a fictional theory. Is it possible that Pangea supercontinent cracked because of a fallen meteroid? Is it theorotically possible? if no, why? If yes, how large would the meteroid be?

Marc Fries: No. Any impact large enough to scatter the continents would have destroyed the Earth.

Boubakeur: what are meteors from and what can they do. What forms meteors are they just rocks

Marc Fries: Most meteors (to be clear, we mean the streaks of light in the night sky and not rocks found on the ground) come from asteroids or comets. They are small rocks or even sand grain size particles that burn up high in the Earth's atmosphere.

Colec: I heard the world will be attack by Mayans in 2012 by a meteorite. Is true?

NASA Chat: Why Meteorites Matter
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November 8, 2012

Marc Fries: Check out nasa.gov/topics/earth/features/2012.html

Neal: Marc is there a way I can send some photographs to you guys to get your opinion on these samples I have here at the Space Center?

Marc Fries: I'd be happy to look at them but another excellent resource that I would suggest is the Mineral Sciences Department at the Smithsonian.

Larry: When was the last time anyone was struck by a meteorite?

Marc Fries: The last time this happened in the United States was in Sylacauga, Alabama, in 1954.

Moderator Brooke: Hey everyone -- a little bonus. Here's an image of meteorites from the personal collection of meteorite hunter Mike Hankey:
http://www.flickr.com/photos/nasamarshall/8167592969/in/photostream

NarfArf: I recall hearing of a meteor that struck down in the Yucatan Peninsula which was partly responsible for wiping out the dinosaurs. Have there been any other records in recent history of meteors of anywhere near this size, and what is the largest meteor known to have collided with Earth?

Marc Fries: You are talking of the Chicxulub impact which occurred 65 million years ago. There have been smaller ones since but nothing near the same size. The largest one would be the Mars size impactor that hit the Earth and produced the moon.

Akhilg: are these meteorites pieces from stars? or are they just space rocks just like that?

Marc Fries: Meteorites come from asteroids -- small bodies that are mostly found between Mars and Jupiter. A very small number come from Mars and the moon.

Meteoriteman: When searching for meteorites, most people use a metal detector. In Northern Ontario, we have mineral rich rock called the Canadian Shield. Would this significantly interfere with detection through false positives?

Marc Fries: Some metal detectors can discriminate between the two. The best tool for finding meteorites however is a well trained eye.

AAHaulward: What kind of precautions will the USA take to protect the Earth from a relatively large asteroid and what will be the next step in presence of any sort of possible danger? I wonder what is the greatest extent of defence reaction that the USA can exhibit?

Marc Fries: I do the small rocks; the big rocks are handled by the JPL Near Earth Object Office in California.

NASA Chat: Why Meteorites Matter
Experts Dr. Bill Cooke and Dr. Marc Fries
November 8, 2012

ToeBee: If a Tunguska type of event were to happen today in an uninhabited area or over the ocean, would we know about it? Seismic sensors, wave height... anything?

Marc Fries: Infrasound arrays would detect that.

Ekdarnell: don't meteorites also come from leftover comet debris? (e.g. if a leonid meteor becomes a meteorite?)

Marc Fries: Meteorites don't come from comets. Comets are too fragile and they cross the Earth's orbit at far too fast to survive.

Annamari: If the Earth hasn't got an orbit, It wolud be an asteroid? (the weight is importatnt or the asteroid has got dry surfaces or it covered by water?)

Marc Fries: An asteroid is a small rocky body orbiting the Sun; a planet is much bigger, but it also orbits the Sun.

Akhilg: how can we distinguish a meteorite from a normal earth rock?

Marc Fries: Meteorites usually have a fusion crust. A fusion crust is a dark coating like a pottery glaze that is created when the meteorite burns its way through the atmosphere. Meteorites are typically denser than Earth rocks and is probably magnetic (will attract a magnet). Also, meteorites often have metal in them to some extent.

Meteoriteman: Could plate tectonics have erased evidence of any large meteor impacts?

Marc Fries: Yes. There are old impact craters like Sudbury in Canada that have been deformed by crustal movement. Restructuring of the planet's surface by plate tectonics has certainly erased a lot of the oldest craters.

Larry: Do any of the meteors in meteor showers like the Geminids or Perseids ever make landfall?

Marc Fries: No, meteor showers are moving too fast to survive passage through the Earth's atmosphere.

Akhilg: Have any meteorites discovered with any material other than that present on earth?

Marc Fries: Yes. There are a number of minerals found in meteorites that have not been found on Earth. Some exotic sulfides, silicates and the Widmannstatten pattern seen in iron-nickel alloys are unique to meteorites.

marsB4stars: Is there any obvious way to distinguish terrestrial basalt from a meteorite of basaltic composition?

Marc Fries: Yes. Presence of a fusion crust indicates a meteorite.

NASA Chat: Why Meteorites Matter
Experts Dr. Bill Cooke and Dr. Marc Fries
November 8, 2012

Puckslinger: I read that in some meteorites we have found protein chains is that true?

Marc Fries: No. Protein is exclusively created by living creatures and no signs of biology have ever been proven in a meteorite.

Ekdarnell: Some meteorites do come from comets, in the sense that comets leave debris that we sometimes experience as a meteor shower. Some of these meteors ends up becoming a meteorite (impacting Earth).

Marc Fries: Meteorites do not come from comets. Comets are too fragile and are moving too fast to survive passage through the Earth's atmosphere.

Sunniejo: What causes an asteroid to set in motion and leave the asteroid belt>

Marc Fries: Two things. One: an impact in the asteroid belt can generate debris that's flung into orbit outside the asteroid field. Two: gravitational interaction with other large bodies, to include Jupiter ,can alter an asteroid's orbit to the point it leaves the asteroid belt.

NarfArf: Do we have a rough estimate of how many meteors have made impact on the earth in human (Homo Sapiens) history?

Marc Fries: No, we don't know.

Larry: Are there any impact craters in Alabama that can be seen (I live in Huntsville)?

Marc Fries: Yes. The Wetumpka Crater.

Adolpha: Are there elements present on Earth which arrived here by meteorite?

Marc Fries: They don't bring any elements that weren't already here.

marsB4stars: What defining features other than fusion crust should you search for when identifying a carbonaceous chondrite under a binocular microscope?

Marc Fries: Fusion crust is the primary indicator. For any other indicators, you would need elemental or mineralogical analysis.

AAHaulward: how are the dimensions of the smallest meteorites that have been found?

Marc Fries: The smallest meteorites are dust size. They are collected by NASA aircraft and have also been collected from ice in Antartica.

Moderator Brooke: Excellent questions, everyone -- Marc and Bill are working on answers. Thanks for your patience...

NASA Chat: Why Meteorites Matter
Experts Dr. Bill Cooke and Dr. Marc Fries
November 8, 2012

A.bombard: Do all asteroids contain a "Core" such as planets? And do they all have a gravitational pull to some degree? I know comets do not have any gravitational pull.

Marc Fries: Good question. The answer is no. Not all asteroids were large enough to form a melted core. And, yes, they all have a gravitational pull. Anything with mass, including comets, has a gravitational pull.

Adolpha: Where do the majority of meteorites come from?

Marc Fries: The asteroid belt between Mars and Jupiter.

NarfArf: You mentioned a Mars size impactor that created the moon that we have today. Do we know of any other meteorites or celestial bodies with the potential (speed, mass, etc) to make impacts similar or even greater in power and consequence?

Marc Fries: Not in the present day. In the past, the solar system had more large impactors. These have now been broken up or accreted in planets.

Adolpha: Are there any large craters in the UK?

Marc Fries: Do an Internet search for impact crater databases. There are several good ones available and they will point out all the craters.

Puckslinger: Do you think we will ever be struck by a projectile from outside of our solar system and could it possibly contain any new elements ?

Marc Fries: We have no indication that we face a danger from objects from outside our solar system. However, the velocity of such an object would probably be quite large. No, it would not contain any new elements.

Moderator Brooke: Hi everyone -- we have about 10 minutes left in our chat, so if you have questions for Marc and Bill, now is the time to ask...

AAHaulward: As far as i know they have been finding the meteorites on other planets as well. Do they have a chance to examine those rocks and if so, what are the differences among the asteroids in different planets and reasons ?

Marc Fries: Our rovers on Mars have located several meteorites on that planet. The rovers themselves analyze them and were even able to classify one of them as an iron meteorite identical to a type that has been found on Earth. The meteorites delivered to the Earth are probably similar in type to those that have fallen on inner solar system planets.

Akhilg: are there any places on earth, where there is more chance of finding a meteorite without knowing about the collision happened before? I mean due to earths features?

NASA Chat: Why Meteorites Matter
Experts Dr. Bill Cooke and Dr. Marc Fries
November 8, 2012

Marc Fries: Antarctica is especially good for finding meteorites because there are vast stretches of ice where the only rocks you find are meteorites.

J.Moleveld: Are meteorites all rock, or is there evidence of more materials connected? Could you please tell the correct name(s) for this?

Marc Fries: As far as we know, all meteorites are either rock, metal or mixtures of the two.

Adolpha: What is the difference about an ordinary meteorites and a fireball?

Marc Fries: A fireball is the passage of a meteoroid through the atmosphere and meteorites are rocks that survive the fireball and fall to Earth.

Sandy: if i find a rock how do i know if its a Meteorities or a simple rock..?

Marc Fries: First, the most obvious thing is to look for a fusion crust. A fusion crust is a dark coating like a pottery glaze formed when the meteorite passed through the atmosphere.

Akhilg: As you mentioned before, how could you be sure that there will not be any new elements present outside our solar system?

Marc Fries: Because the processes that create a solar system are largely the same from one star to another.

NarfArf: Is it, theoretically, possible for a celestial object to contain a mass similar or greater than that of earth and not be in the orbit of any sun. A "rogue" planet, of osrts?

Marc Fries: Yes. It is possible for planets to be ejected from solar systems, particularly in early stages of their formation. Our own solar system is stable and this isn't a concern.

Sunniejo: what causes a Martian meteor to leave its home planet?

Marc Fries: An impact by a large asteroid onto the Martian surface, if it's energetic enough, can eject material out of Mars' orbit.

Adolpha: Have meteors been observed in other planetary systems?

Marc Fries: Asteroid belts have been observed around other stars.

Adolpha: Why is it that most meteors hit Earth somewhere in the Americas? Is it simply because this is the largest landmass, or is there a scientific reason?

Marc Fries: Meteorites land more or less evenly all over the Earth's surface, but tend to be recovered more in some places than others. Some places have more finds than others because people hunt for them there.

NASA Chat: Why Meteorites Matter
Experts Dr. Bill Cooke and Dr. Marc Fries
November 8, 2012

Adolpha: Have meteors from other galaxies ever hit the Earth or any planet? Is this theoretically possible?

Marc Fries: No.

Moderator Brooke: Thanks to everyone for being here today -- excellent questions. Marc and Bill, thanks for taking time to be here and shed some light on meteorites. We'll have a transcript posted early next week. Have a great afternoon/evening.

NarfArf: Many thanks for the enlightenment, and have a nice day!

Moderator Brooke: Thank you, Narf -- enjoyed your questions!

Annamari: Thanks for chat,Let's keep in touch!

Moderator Brooke: You bet -- have a great evening.

AAHaulward: Thanks NASA, Dr. Fries and Brooke so much for making this event possible. I hope you will have a nice day!

Moderator Brooke: You're very welcome -- we love these chats!

Akhilg: Thank you very much.

Moderator Brooke: Our pleasure.